GRPC activity for EuDHCAL in IHEP-Protvino

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EuDHCAL meeting CERN,
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What to do

- RPC R&D was done
- RPC prototypes toward 1 m2 were done
- 1m2 RPC design and construction should be done

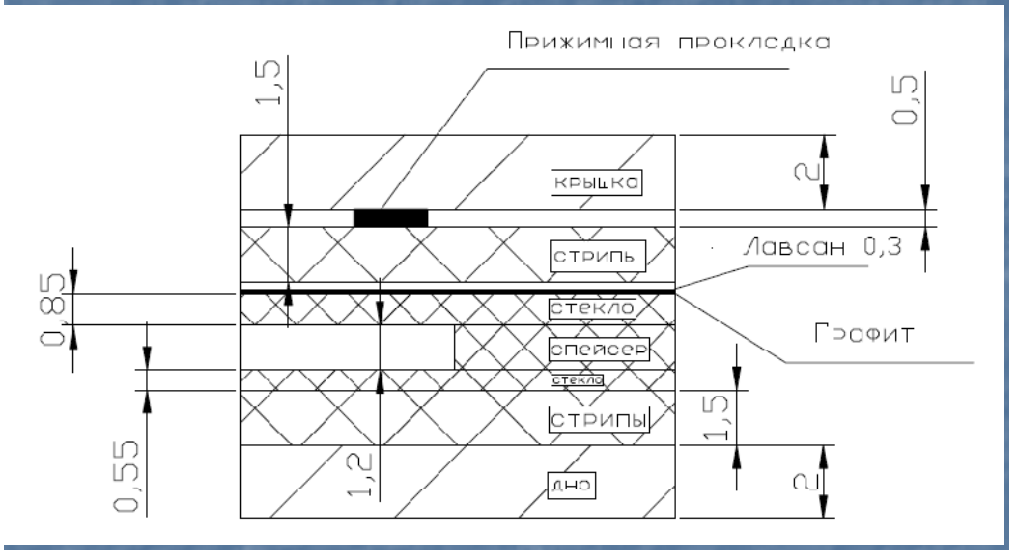
Selected RPC performance

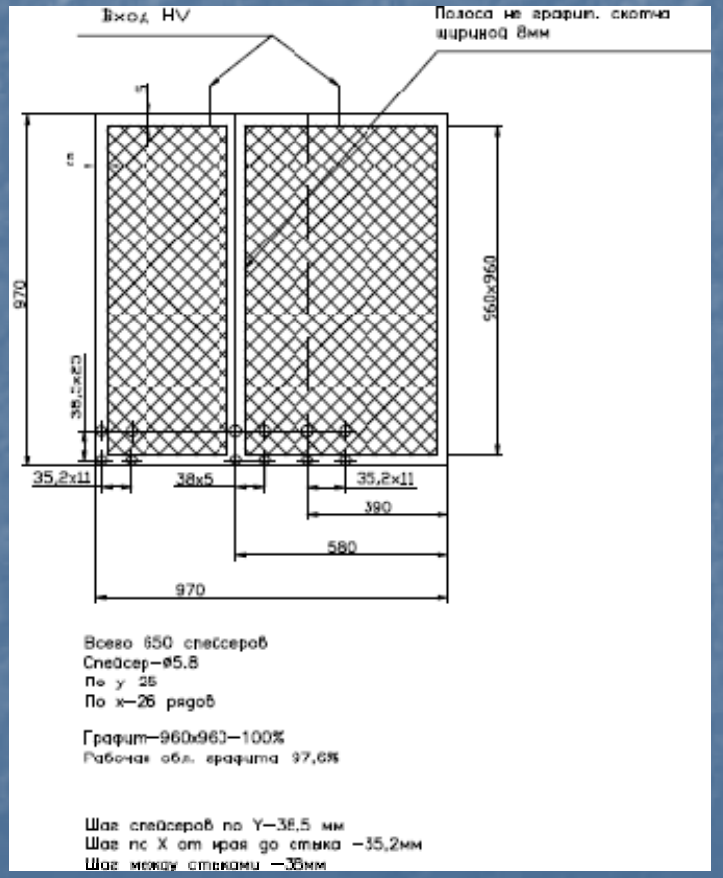
№	Item	Value	Comments
1	Pad size	1x1 cm2	
2	Number of gaps	monogap	
3	Mode of operation	saturated avalanche	
4	Working mixture	TFE/Iso/SF6=93/5/2	
5	Gas gap	1.2 mm	1.6 mm can be used
6	Resistive plates	thin glass,10^13 Ω·cm	
7	HV working point, kV	7.4	
8	Induced charge, pC	~3	
9	Threshold on 50Ω, mV	1-2	
10	Efficiency, %	~98	
11	HV plateau	~600 V	
12	σ_Q / Q	~ 1	
13	Pad multiplicity	1.4-1.5 ?	
14	Noise, Hz/cm^2	~ 0.5	
15	Rate capability, Hz/cm^2	≤100	
16	Resistivity of HV coverage	> 10^6 Ω/ sq	
17	Control of RPC work	Q RO of cathode strips	
18	Maximal own RPC thickness	6 mm	try to keep 5 mm
	with 2 mm SS cups	10 + 0.5 mm	

RPC prototypes toward 1 m2

- 8x8 pads prototypes 2004
- 1 m2 prototype with strips 2004
- 40x100 cm2 pads prototype 2006
- 8x32 pads prototypes for new FEE 2007

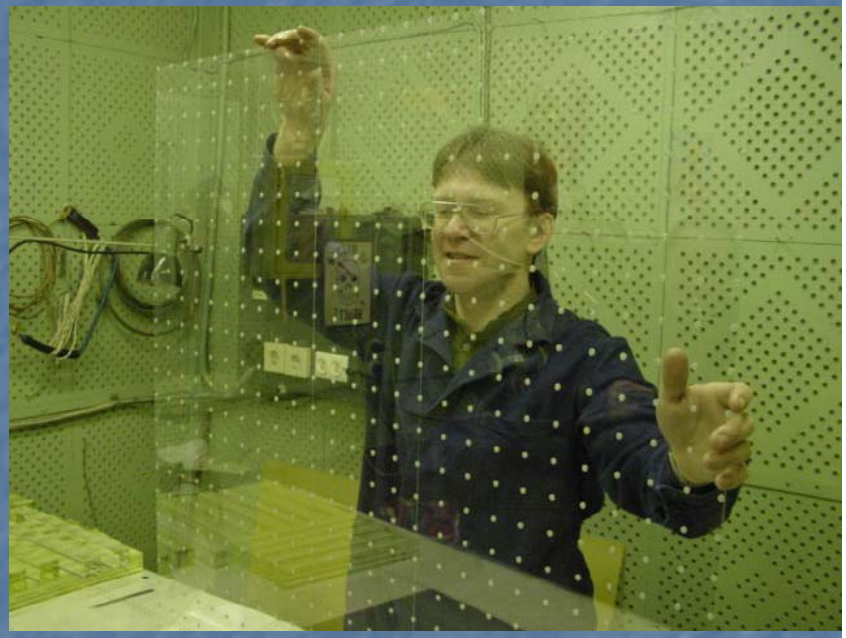
1 m2 prototype with strips





1 m2 prototype with strips

16x and 16 y strips of 6 cm width



Detailed study of the plane was performed in cosmic rays.

In general :

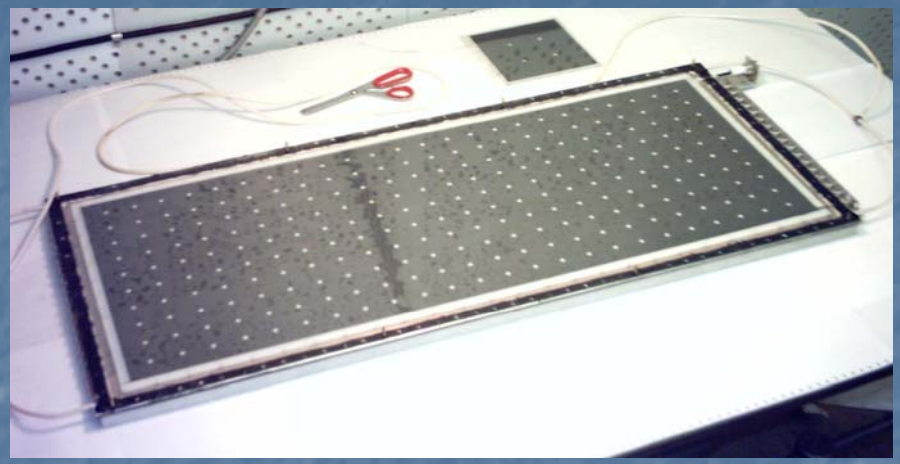
- the plane is robust and hermetic;
- inefficiency of about 6% is compatible with the geometrical one due to spacers;
- uniformity of efficiency on the large scale (0.06 m2 area) is (94+/-2)%;
- current in HV circuit is 1 μA;
- noise at the plateau knee of about 0.45 Hz/cm2 is acceptable.

40x100 cm2 prototype

RPC with sensitive area of 36x96 cm2 was produced to incorporate 32x32 =1024 pads of 1 cm2 area.

For read-out the 2 anode PBs with 16x32=512 pads were used. Connections between pads and the 64 ch. FEE are made by microcoax 50 ohm cables.

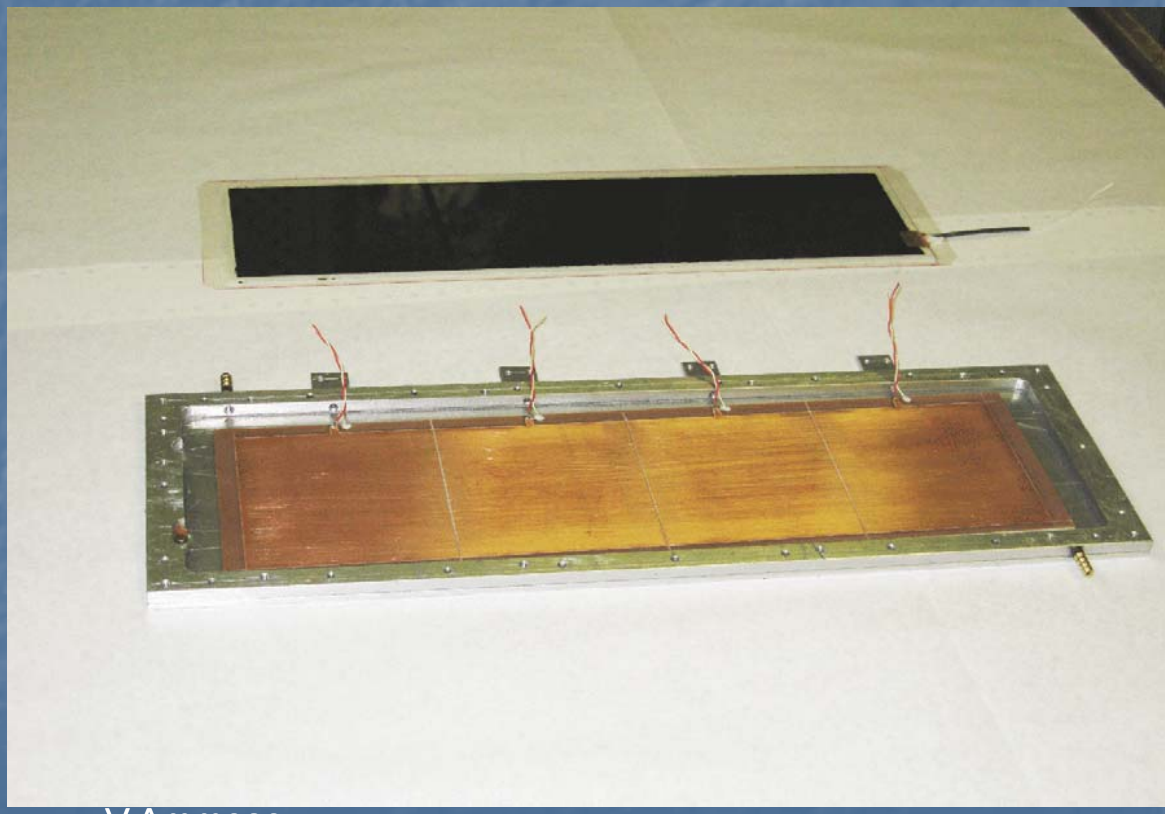
It was found that tightness between anode PB and RPC gas volume is needed.



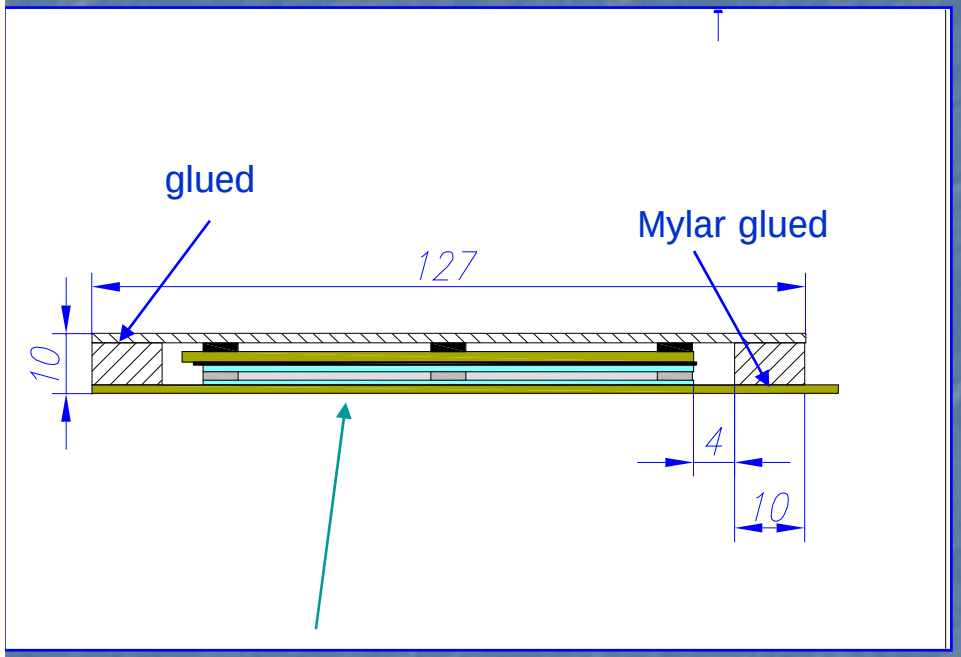
8x32 pads prototypes for new FEE

- 3 RPCs with spacers
- 6 RPCs with fishing lines

were produced

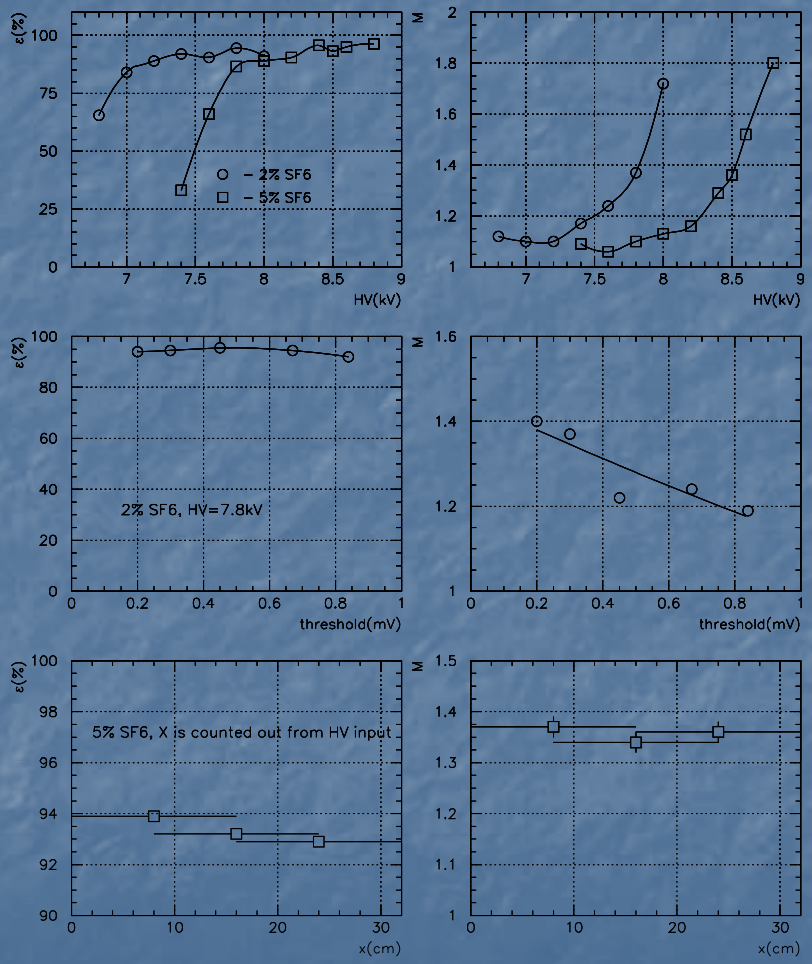


8x32 pads prototypes for new FEE



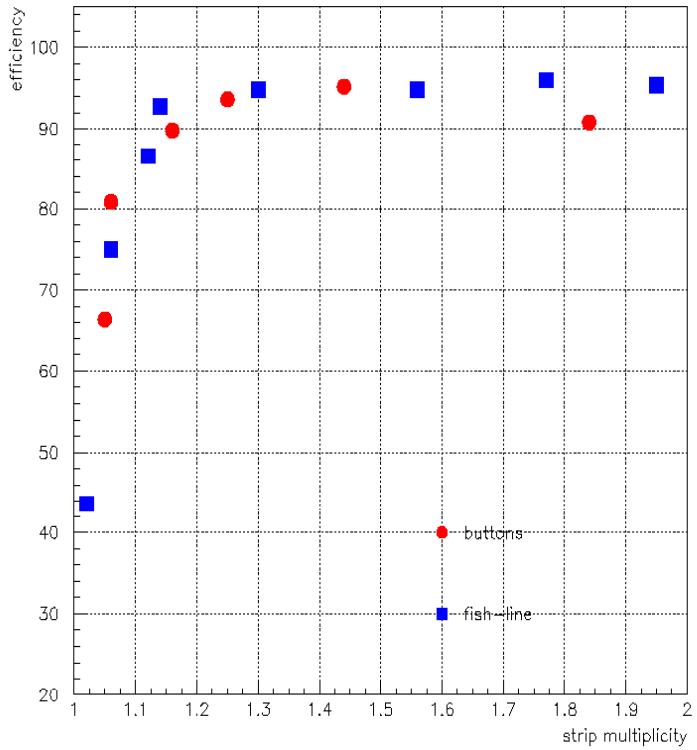
It is needed to press anode pad PCB

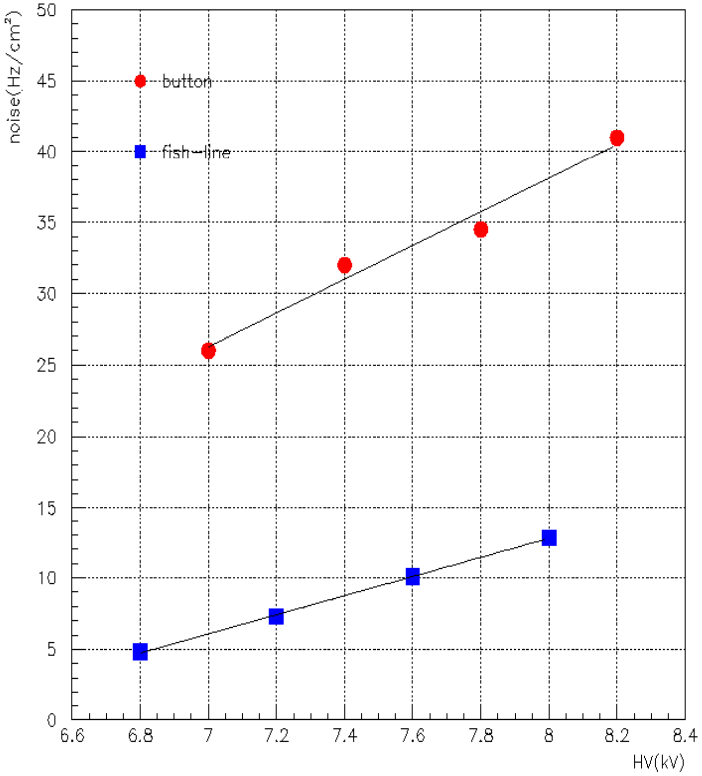
to RPC glass to have good contact



8x32 pads prototypes for new FEE

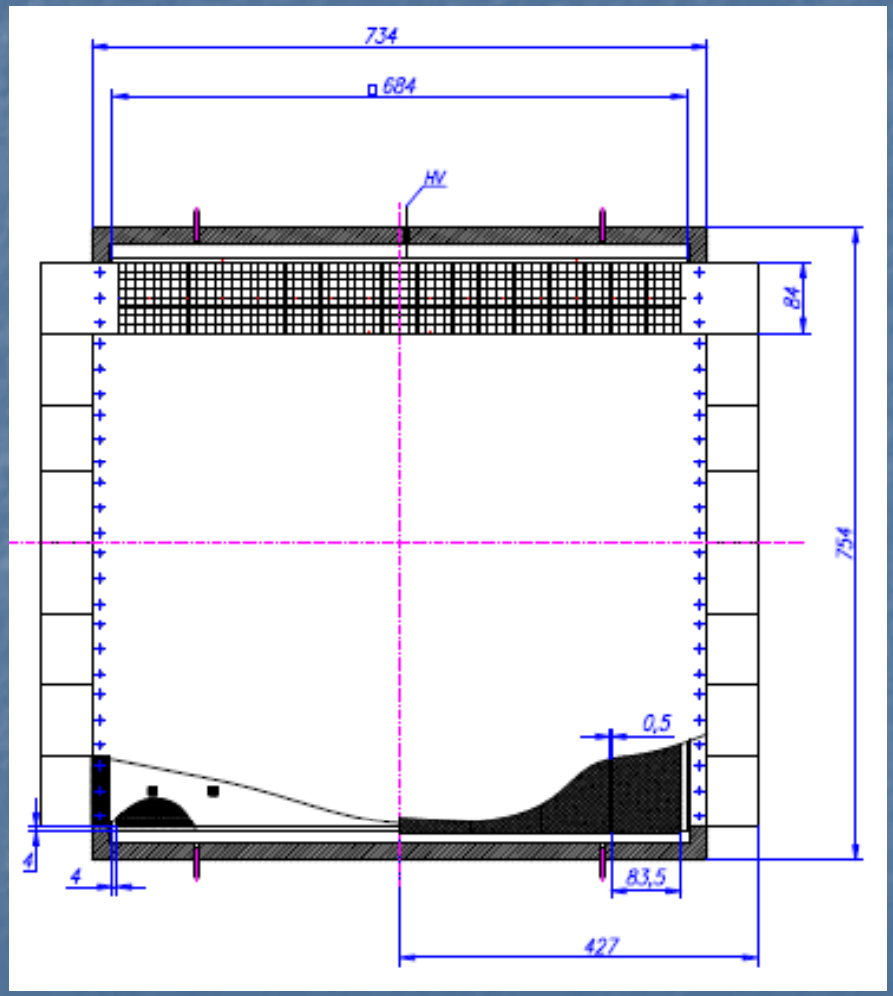
spacers vs fishing lines





Proposal for 1(0.7) m2 RPC

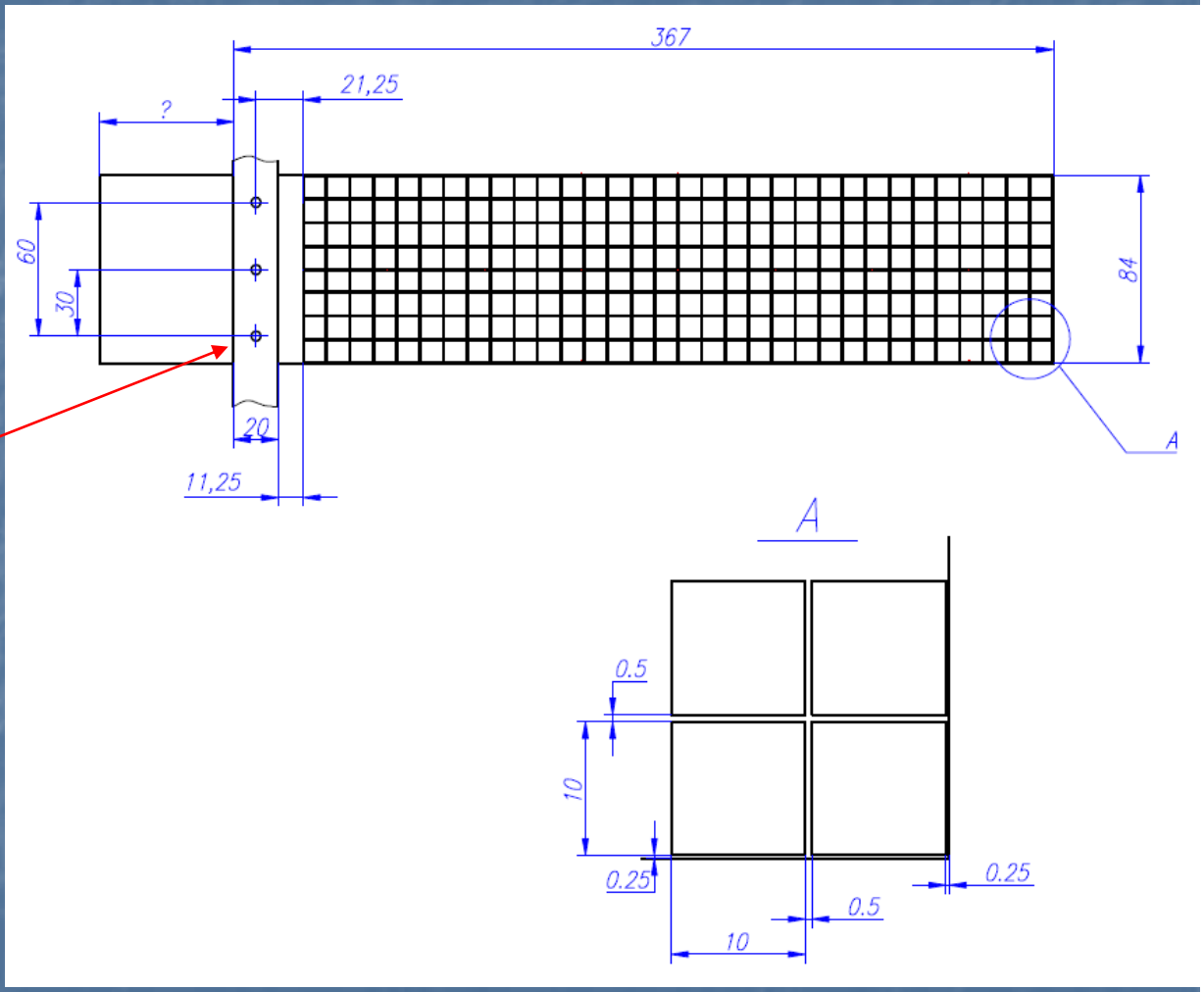
- Design as for 8x32 pads RPC
- 8 of 8x32 pads PCD for each side
- Read out from both sides
- RPC gas volume closed by mylar
- Can use composite glass plane



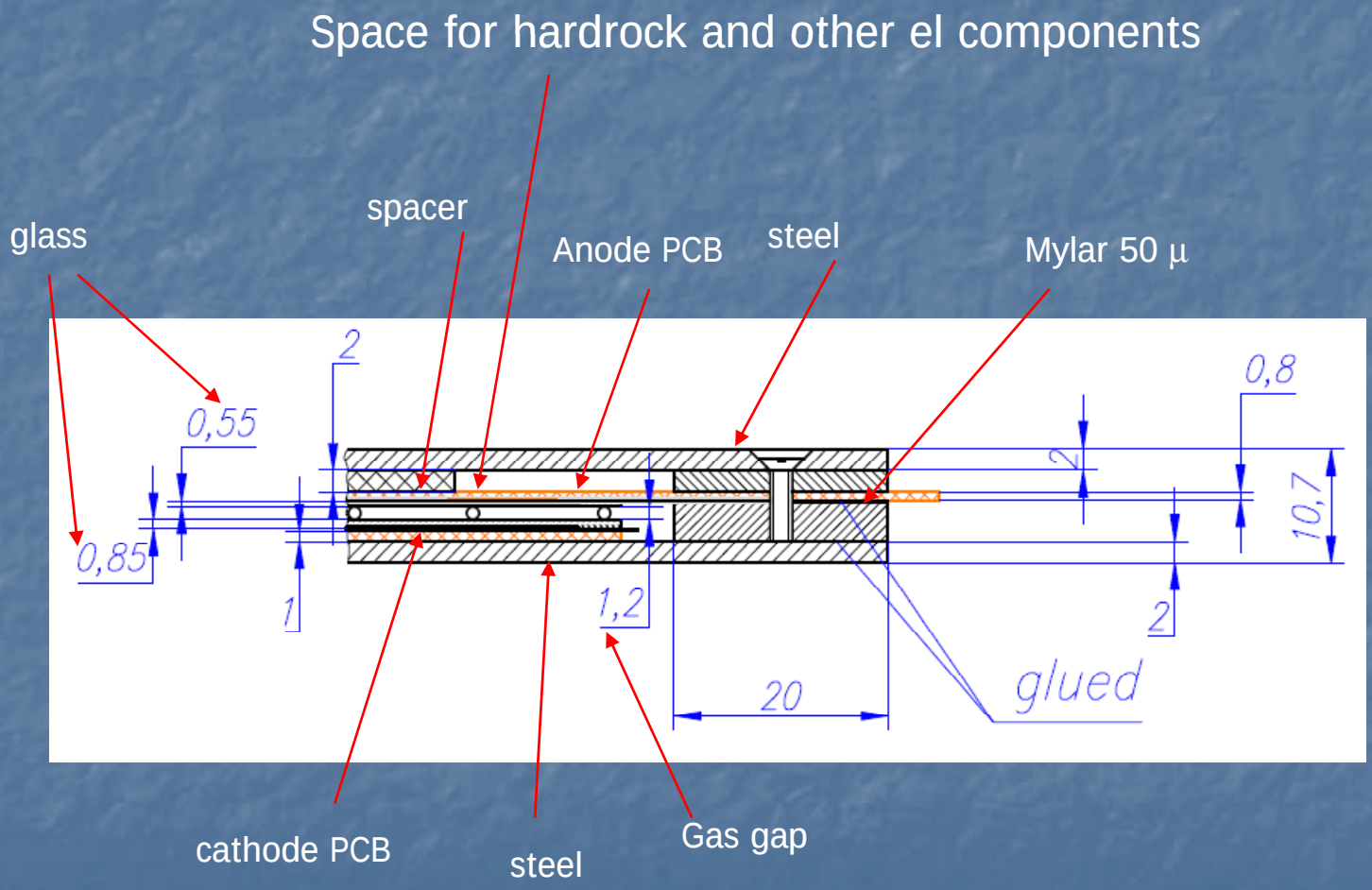
Proposal for 1(0.7) m2 RPC

Anode pads PCB

Is it possible to have holes in the anode PCB ?

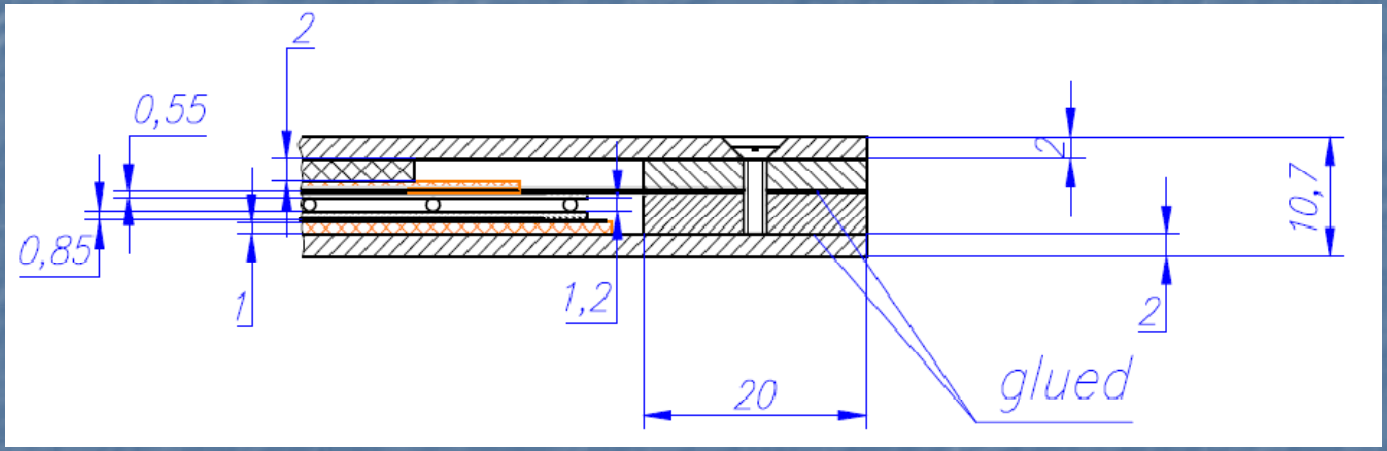


Proposal for 1(0.7) m2 RPC



Proposal for 1(0.7) m2 RPC

Other cross section



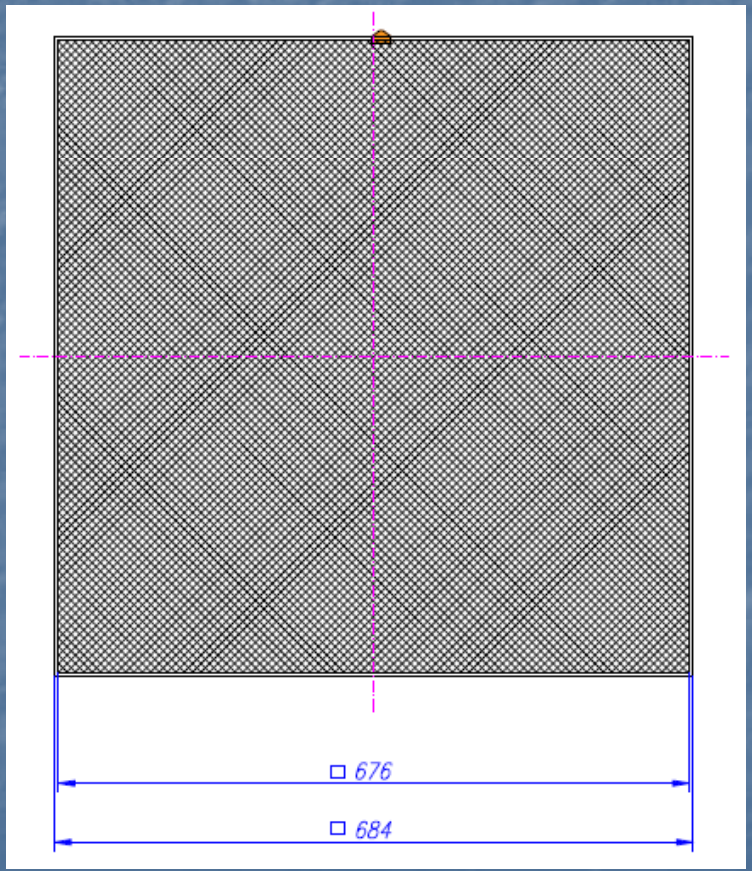
Problem to have contact between glass and PCB

May be to glue ?
May be single gas volume within steel plates ?

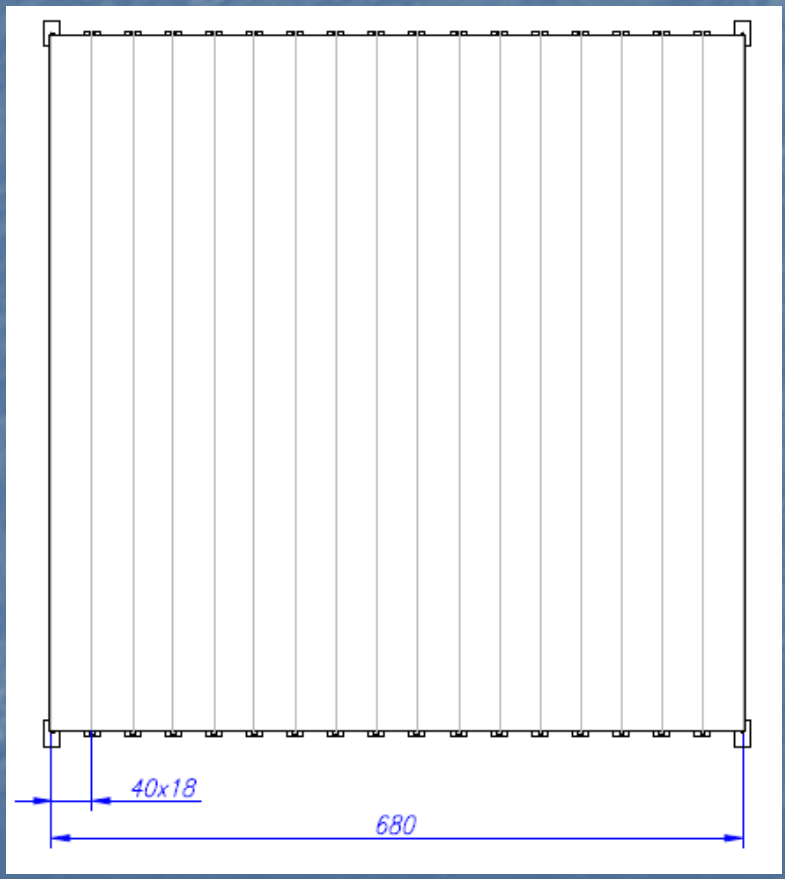
Proposal for 1(0.7) m2 RPC

HV coverage

Enamel ~1 Mom/sqr

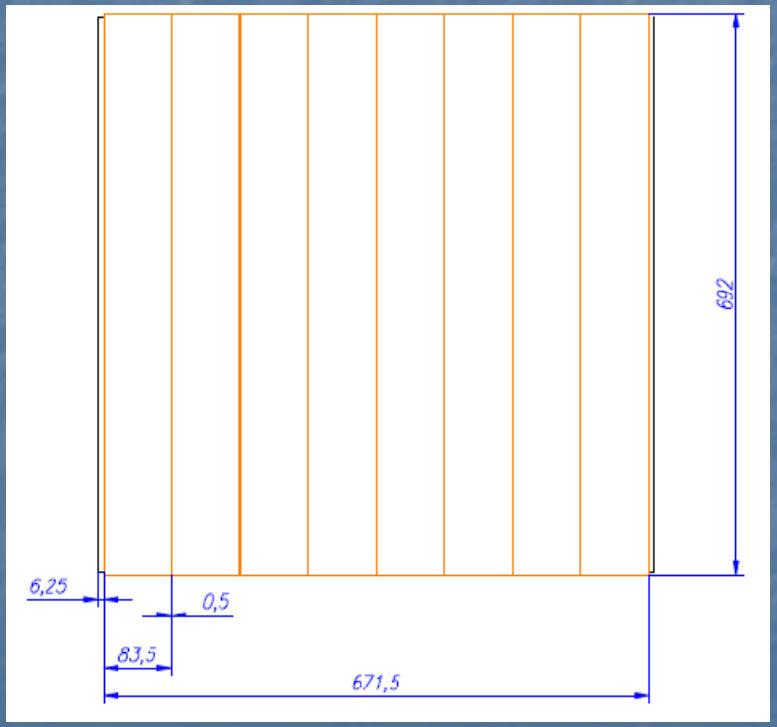


Glass assembly with fishing lines

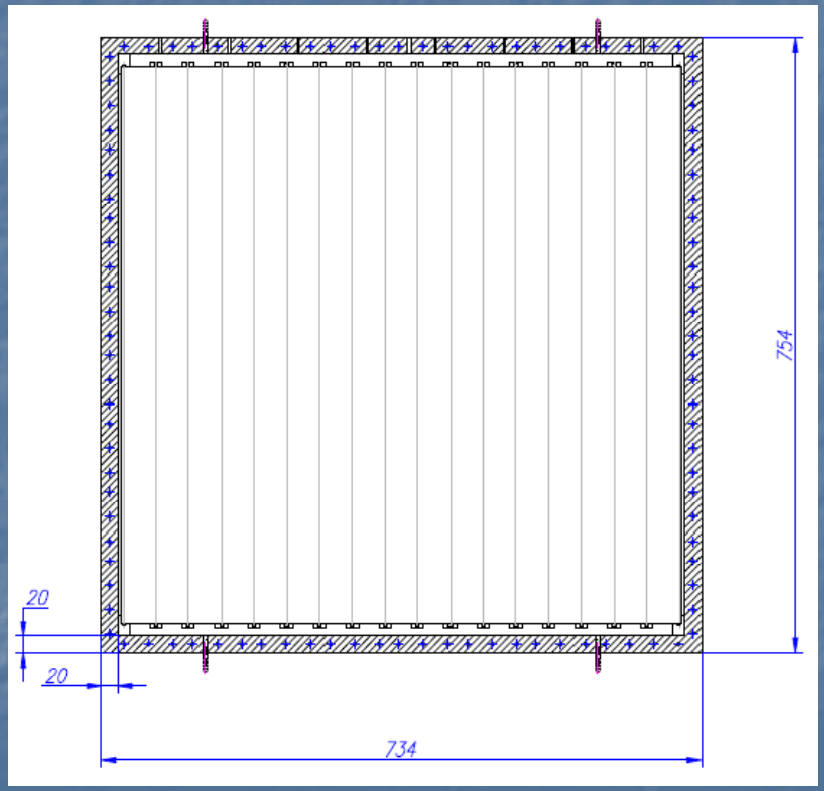


Proposal for 1(0.7) m2 RPC

It is proposed to have cathode strips to register charge information for control if no charge read out from hardrock

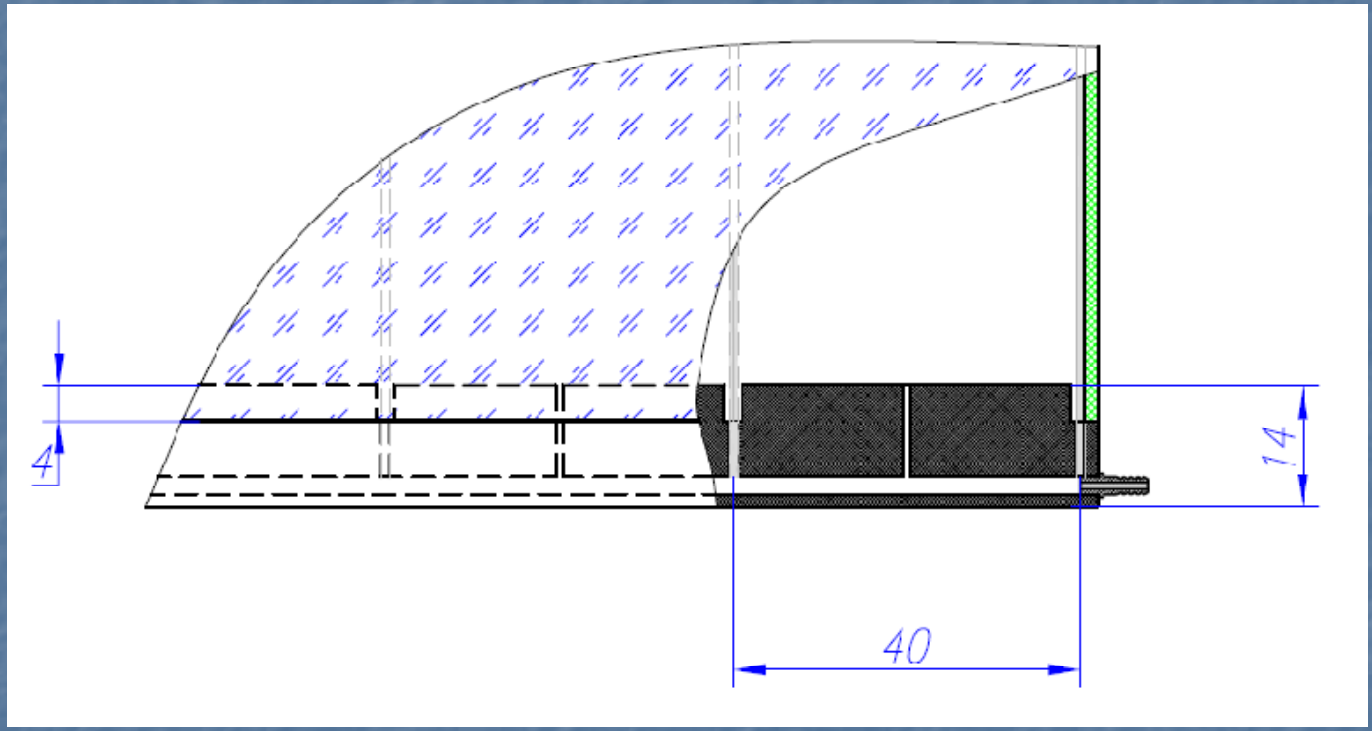


Glass assembly fixed in the frame



Other design for 1(0.7) m2 RPC

Closed gas volume



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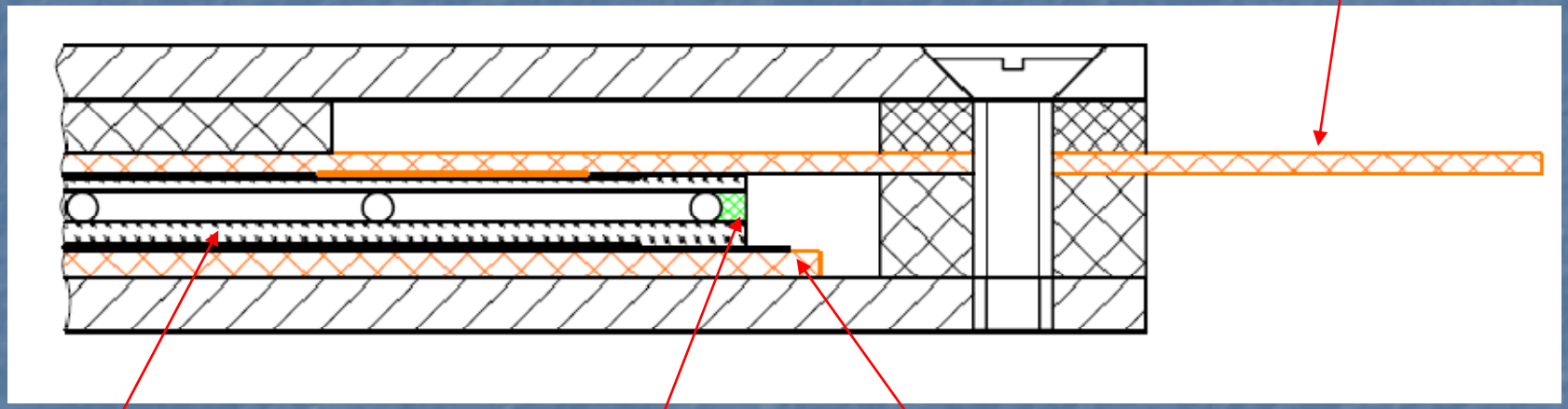

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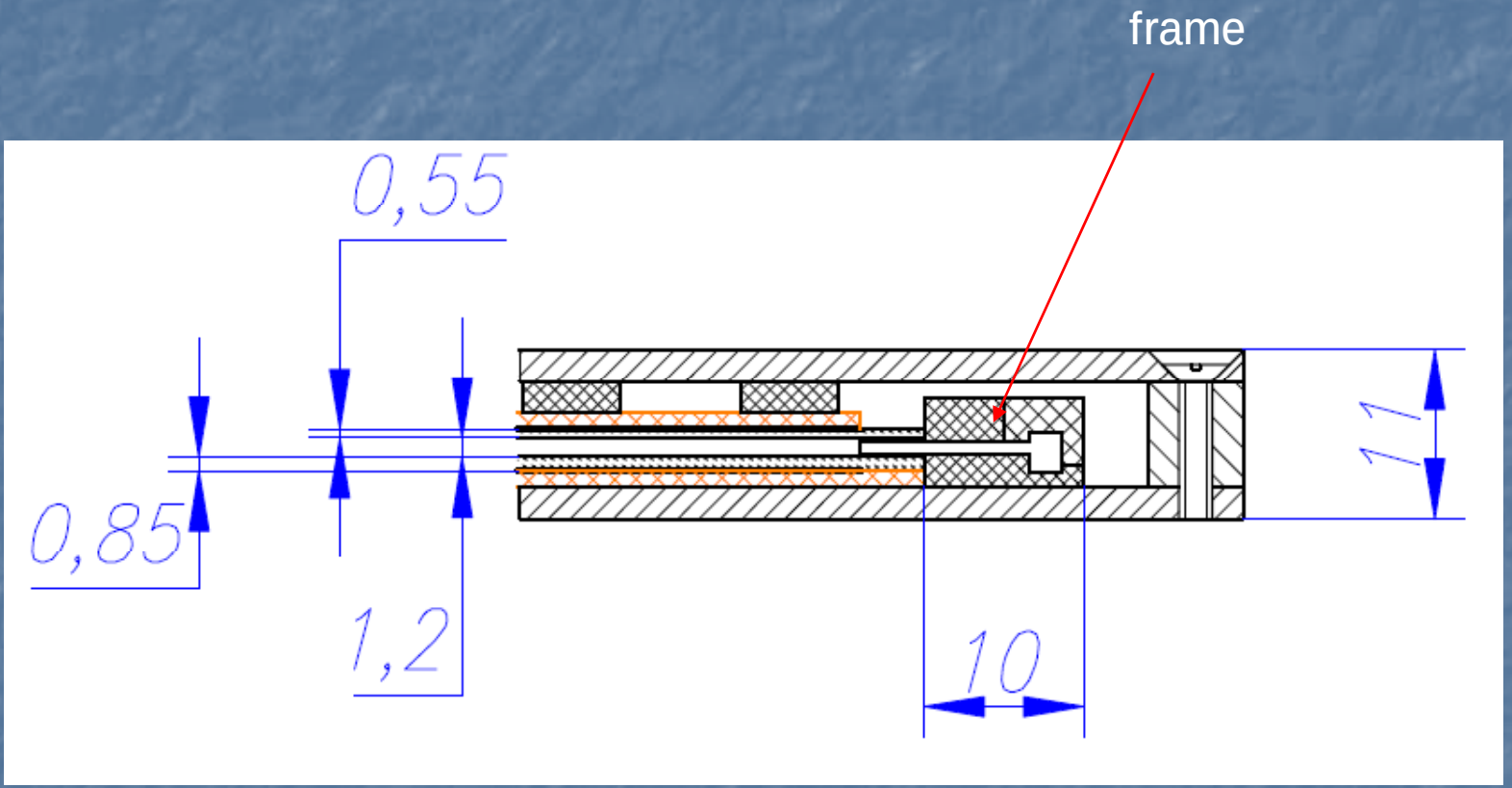

Questions in conclusion for 1m3 EuDHCAL prototype

- General structure of 1m3 (AHCAL, other) ?
- 0.7x0.7 m2 or 1x1 m2 RPC ?
- sizes of anode PCB ?
- are holes possible in anode PCB ?
- How to press anode PCBs to glass ?
- Try several designs in the frame of common requirements ?